

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

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and JOSHUA W. SMITH

HP Docket No. 10012053-1

Serial No. : 10/052,815

Examiner M. Padgett

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Group Art Unit 1762

For : METHOD OF PREPARING A SURFACE FOR ADHESION

**REPLY BRIEF**

**Claim Elements**

The following specific claim elements are discussed below. They are repeated here for emphasis.

Claim 2: resettling ablation debris from an initial ablation on to the substrate surface to shadow a portion of the surface; then effecting ablation of a non-shadowed portion of the surface; and then applying an adhesive to the surface.

Claim 10: a first step of directing laser radiation towards the surface to effect ablation of a substrate surface; after the first step, resettling the ablation debris to shadow a portion of the surface; after resettling the ablation debris, a second step of directing laser radiation towards the surface at an intensity sufficient to cause ablation of the substrate but not sufficient to cause substantial ablation of the debris; and then applying an adhesive to the surface of the substrate.

Claim 18: forming a first amount of ablation debris; then adjusting the fluence of the laser between an ablation threshold of the substrate and an ablation threshold of the first ablation debris; then further ablating the substrate surface to progressively cover the surface with a second amount of ablation debris to effect formation of raised structures; and then applying an adhesive to the surface.

Claim 21: shadowing a portion of a component surface with ablation debris to form higher and lower threshold ablation regions; then ablating the lower threshold region; and then applying an adhesive to the component surface.

**Distinguishing Brennen and Taylor – Claims 2, 10, 18, 21**

In evaluating the question of obviousness, the Examiner must first determine the scope and content of the prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). Only then can she properly ascertain the differences between the claimed subject matter and the prior art. Where, as here, the Examiner has misinterpreted the scope and content of Brennen and Taylor, she has likewise failed to ascertain the full measure of the differences between the prior art and the claimed subject matter. Accordingly, the Examiner has failed to carry her burden of establishing a prima facie case of obviousness.

So far as might be deemed relevant to the claimed subject matter, Brennen stands for the unremarkable proposition that texturing a surface using laser ablation was known in the art and Taylor shows only that ablation debris may cause the formation of cones on the ablated surface. Neither Brennen, Taylor nor the combination of Brennen and Taylor discloses or fairly suggests (1) resettling or otherwise using ablation debris to shadow a surface for subsequent ablation in general, and specifically not in advance of applying an adhesive to the surface (Claims 2, 10 and 21) and (2) adjusting the fluence of the laser between an ablation threshold of the substrate and an ablation threshold of first ablation debris on the surface of the substrate and then further ablating the substrate surface to progressively cover the surface with a second amount of ablation debris to effect formation of raised structures (Claim 18). As detailed below, the Examiner's assertions to the contrary are not correct.

**Brennen.**

The only reference to ablation debris in Brennen is found in the following discussion of a cleaning step, at paragraph 0091. (Consistent with the Appeal Brief and Answer, references are to the Brennen patent publication 20050242059 rather than to the Brennen patent 6919162.)

**[0091]** As a final optional step in laser ablation process, a cleaning step is performed wherein the laser-ablated portion of the substrate is positioned under a cleaning station. At the cleaning station, debris from the laser ablation is removed according to standard industry practice.

Admittedly, Brennen implicitly acknowledges in this passage that debris may be generated during laser ablation. This acknowledgement, however, cannot reasonably be construed as suggesting to the ordinarily skilled artisan that any such debris is resettled on the ablated surface or otherwise used to shadow the surface for subsequent ablation, as in Claims 2, 10 and 21 (or even that the debris *could* be used as claimed). Indeed, conspicuously absent from Brennen's lengthy description of ablation "masks" is any mention of the use of ablation debris as a mask or "shadow" (resettled or otherwise). Similarly with regard to Claim 18, there is plainly nothing in Brennen that even remotely suggests the process of adjusting the fluence of the laser *after* ablation debris has accumulated on the ablated surface as claimed and then further ablating the substrate surface to progressively cover the surface with a second amount of ablation debris to effect formation of raised structures.

The Examiner seems to argue at page 15 of the Answer that the reference at Brennen paragraph 0086 to a "small particle of material that remains of the previous layer may be enough to initiate the formation of a cone ...." somehow suggests resettling or shadowing as claimed. Brennen paragraph 0086 is reproduced below in its entirety.

[0086] Intrinsic feature definition depends on specific properties of the material being ablated. For example, intrinsic feature definition (i.e., "roughening") using laser ablation relies on the phenomenon known as coning or cone formation. This cone formation occurs when the fluence of a laser pulse at the substrate is not high enough to completely remove a whole layer of material. Even a small particle of material that remains of the previous layer may be enough to initiate the formation of a cone or cone-like feature since this particle of material may not be removed by subsequent laser pulses but instead act as a sort of mask, creating a cone behind it as the laser ablates further down into the material around the particle. See Krajnovich et al. (1993) *J. Appl. Phys.* 73:3001-3008.

Note first that the "a small particle of material that remains **of** the previous layer" clearly refers to what is left over after ablation, not debris that has been ejected from the

previous layer and then resettled to form a remnant of that layer. Note second that the immediately preceding sentence removes all doubt as to the source of any small particle of material that remains -- "This cone formation occurs when the fluence of a laser pulse at the substrate **is not high enough to completely remove a whole layer of material.**" Thus, the subsequent reference to "a small particle of material that remains of the previous layer" is conclusively established to be material that was not removed in the ablation. The Examiner's argument in this regard, therefore, is without merit.

Finally with regard to Brennan, it should be noted (1) conspicuously absent from Brennen's lengthy description of masking is any mention of the use of ablation debris as a mask and (2) as detailed in the Appeal Brief, the 1993 Krajnovich et al. article (73 J. Appl. Phys. 3001) which Brennen cites with approval teaches away from the notion that the mere presence or formation of cones in a laser ablation process implies that the cones were formed as a result of shadowing by ablation debris.

Taylor.

Taylor is an article from the Journal of Applied Physics in which the authors show that ablation debris may accumulate on the ablated surface (Taylor page 2815) and that "cone formation is due to ablated debris and not to impurities...." (Taylor page 2817).

With regard to Claim 18, as with Brennen, there is nothing in Taylor that even remotely suggests the process of adjusting the fluence of the laser *after* ablation debris has accumulated on the ablated surface as claimed and then further ablating the substrate surface to progressively cover the surface with a second amount of ablation debris to effect formation of cones or any other raised structures. It necessarily follows, therefore, that the combination of Brennen and Taylor does not teach or fairly suggest these elements of Claim 18.

While the question of the obviousness of Claims 2, 10 and 21 in view of Taylor is, perhaps, not as clear-cut as Claim 18, the two part process of these claims still cannot reasonably be deemed an obvious adaptation of the teachings of Taylor and Brennen. It is clear enough that the combination of Brennen and Taylor does not teach or suggest a two part process in which ablation debris is resettled on the ablated surface or

otherwise used to shadow the surface for subsequent ablation, in general, and specifically not in advance of applying an adhesive to the surface. Thus, the question of obviousness is not simply a question of combining old elements in a new way as in KSR. Rather, the question of obviousness for Claims 2, 10 and 21 turns on whether or not Brennen and Taylor would lead an ordinarily skilled artisan to a whole new concept -- (1) to recognize beneficial possibilities for ablation debris in general and (2) to conceive the specific ablate/resettle-shadow/further ablate/apply adhesive processes of Claims 2, 10 and 21.

Taylor may suggest debris cones are, in fact, an undesirable characteristic to be minimized or eliminated, noting that such debris formation may be eliminated by increasing laser fluence: "[H]igher fluences are required to totally remove the cone formation from large diameter cuts." (Taylor, p. 2817). Certainly, Taylor does not teach or suggest intentionally forming cones from ablation debris to promote adhesion or for any other purpose. As noted above, Brennen stands for the unremarkable proposition that texturing a surface using laser ablation was known in the art. The only reference to ablation debris in Brennen is found in a discussion of a cleaning step, again suggesting ablation debris is not desirable. It just does not seem reasonable to expect these teachings would lead the ordinarily skilled artisan inexorably/obviously to realize "aha, I can put this ablation debris to a beneficial purpose by first allowing it to resettle on the surface and then performing a second ablation step using the debris to mask or "shadow" the surface to form adhesion promoting structures in advance of actually applying the adhesive."

For all of these reasons, Appellants respectfully submit that the Examiner has failed to establish a prima facie case of obviousness as to Claims 2, 10, 18 and 21 and their respective dependent claims base on Brennen and Taylor.

**Distinguishing Burns and Taylor -- Claims 2, 10, 18, 21**

The same analysis detailed above distinguishing Brennen and Taylor also distinguishes Burns and Taylor. The relevant teachings in Burns are cumulative of the teachings of Brennen and Taylor. Like Brennen, Burns teaches laser ablation using an opaque mask (opaque dots in Burns) to form the desired topography (Burns column 4,

lines 45-49 and column 6, lines 49-50) and cleaning ablation debris (Burns column 6, lines 51-53). The Examiner, therefore, has failed to establish a prima facie case of obviousness as to Claims 2, 10, 18 and 21 and their respective dependent claims based on Burns and Taylor for the same reasons set forth above for Brennen and Taylor.

Respectfully submitted,

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